

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1-16. (canceled)

17. (Previously Presented) A method for improving estimates of average background noise energy in a G.729 Annex B compliant voice activity detection (VAD) device by substituting supplemental average background noise parameters derived according to a supplemental algorithm for a running average of background noise parameters derived according to G.729 Annex B, comprising:

determining a maximum full-band energy, E_{\max} , and a minimum full-band energy, E_{\min} , from a plurality of incoming noise frames during a current period, i ;

generating a noise threshold, $T_{\text{noise}, i+1}$, for the next period, such that $T_{\text{noise}, i+1} = \min(2 * \min(T_1, T_2), -21 \text{ dBm})$, where $T_1 = E_{\min} + (E_{\max} - E_{\min})/32$, $T_2 = 4 * E_{\min}$, E_{\max} = the maximum block energy measured during the current updating period, and E_{\min} = the minimum block energy measured during the current updating period;

determining a full-band energy of a current incoming noise frame, E_i ;

updating supplemental average background noise parameters to the current period;

comparing the supplemental average background noise parameters of the current period to the running average of background noise parameters derived according to G.729 Annex B; and

if the supplemental average background noise parameters of the current period diverge from the running average of the background noise parameters derived according to G.729 Annex B, then substituting the supplemental average background noise parameters of the current period for the running average of the background noise

parameters derived according to G.729 Annex B.

18. (Previously Presented) The method of claim 17, wherein the running average of the background noise parameters derived according to G.729 Annex B is updated for an incoming noise frame, only if $E_f < E_{f,avg} + 3\text{dB}$, $RC(1) < 0.75$, and $\Delta SD < 0.0637$, where E_f = the full-band noise of the current frame and is calculated according to the equation $E_f = 10 \times \log_{10} [1/240 \times R(0)]$, where $R(0)$ is the first autocorrelation coefficient, $E_{f,avg}$ = the average full-band noise energy, $RC(1)$ = the first reflection coefficient, and ΔSD = the difference between the measured spectral distance for the current frame and the running average value of the spectral distance, with a ΔSD of 0.0637 corresponding to 254.6 Hz.

19. (Previously Presented) The method of claim 17, wherein the supplemental average background noise parameters derived according to the supplemental algorithm include full-band energy, low-band energy, a set of Line Spectral Frequencies, and a zero crossing rate for each period.

20. (Previously Presented) The method of claim 17, wherein the running average of the background noise G.729 Annex B include full-band energy, low-band energy, a set of Line Spectral Frequencies, and a zero crossing rate for each incoming noise frame.

21. (Previously Presented) The method of claim 17, wherein the updating supplemental average background noise parameters occurs immediately after the determining a full-band energy of a current incoming noise frame, E_i , if $T_{noise, i-1} \geq E_i \geq -70 \text{ dBm}$ is true, and occurs after a fixed waiting period, if $T_{noise, i-1} \geq E_i \geq -70 \text{ dBm}$ is not true.

22. (Previously Presented) The method of claim 17, further comprising:
waiting an elapsed time period to compare the updated supplemental average background noise parameters to the running average of the background noise parameters derived according to G.729 Annex B.
23. (Previously Presented) The method of claim 22, wherein the waiting an elapsed time period includes using a counter that counts a consecutive number of incoming noise frames, which are not updated according to the method of claim 18.
24. (Previously Presented) The method of claim 17, wherein every period including the current period and the next period equals 1.28 seconds.
25. (New) A method for voice activity detection in a speech encoder/decoder device that handles frames of a digitized voice transmission, comprising:
providing a primary running average of background noise parameters in the voice transmission of block energy, zero crossing rate, and line spectral frequency parameters, wherein the primary running average is updated with the background noise parameters from the frames containing background noise energy meeting conditions defined by parameters of full-band block energy, a reflection coefficient, and a spectral;
providing a secondary running average of the background noise parameters in the digitized voice transmission, wherein the secondary running average is updated with the background noise parameters when frames of noise are that contain a block energy is measured at or below a noise threshold and that is updated with a result of comparing a minimum block energy and a maximum block energy in each frame to a constant; and
substituting the background noise parameters in said primary running average for the background noise parameters in said secondary running average.

26. (New) The method of claim 25, wherein the substituting comprises performing the substitution upon determination of a divergence of the primary running average of the background parameters from the secondary running average of the background parameters.

27. (New) The method of claim 26, wherein the divergence is determined by counting up to a defined number of consecutive frames of the digitized voice transmissions that fail to cause an update in the primary running average of the background noise parameters.

28. (New) The method of claim 25, wherein the substituting occurs after a defined time period.

29. (New) The method of claim 25, wherein the substituting occurs after a defined number of the digitized voice transmission frames have been processed by the encoder/decoder.

30. (New) The method of claim 25, wherein the providing a primary running average of background noise parameters comprises providing the primary running average according to the ITU G.729 Annex B recommendations.

31. (New) The method of claim 25, further comprising:
initializing the secondary running average of the background parameters by selecting a defined number of beginning frames of the digitized voice transmission and calculating, for beginning frames, an average measure of background noise spectral parameters, an average measure of background noise zero crossings, an average measure of background noise energy, and an average background noise low-band energy;

excluding from the initialization any of the beginning frames having the average measure of the background noise energy less than a significantly low energy level; and

excluding from the initialization any of the background noise parameters from beginning frames having a measure of the background noise energy less than the significantly low energy level.

32. (New) The method of claim 25, wherein said providing a secondary running average further comprises declaring said frames of noise when said block energy is measured between said noise threshold and a low level noise energy reference level.

33. (New) An encoder/decoder device that handles a transmission of digitized frames of voice and background noise activity, comprising:

a processor that performs the steps of:

providing a primary running average of background noise parameters in the voice transmission of block energy, zero crossing rate, and line spectral frequency parameters, wherein the primary running average is updated with the background noise parameters from the frames containing background noise energy meeting conditions defined by parameters of full-band block energy, a reflection coefficient, and a spectral;

providing a secondary running average of the background noise parameters in the digitized voice transmission, wherein the secondary running average is updated with the background noise parameters when frames of noise are that contain a block energy is measured at or below a noise threshold and that is updated with a result of comparing a minimum block energy and a maximum block energy in each frame to a constant; and

substituting the background noise parameters in said primary running average for the background noise parameters in said secondary running average.

34. (New) The encoder/decoder device of claim 33, wherein the processor performing the substituting comprises performing the substitution upon determination of a divergence of the primary running average of the background parameters from the secondary running average of the background parameters.

35. (New) The encoder/decoder device of claim 33, wherein the processor performing the substituting comprises performing the substitution when the divergence is determined by counting up to a defined number of consecutive frames of the digitized voice transmissions that fail to cause an update in the primary running average of the background noise parameters.

36. (New) The encoder/decoder device of claim 33, wherein the processor performs the providing a primary running average according to the ITU G.729 Annex B recommendations.

37. (New) The encoder/decoder device of claim 33, wherein the processor further performs the steps of:

initializing the secondary running average of the background parameters by selecting a defined number of beginning frames of the digitized voice transmission and calculating, for beginning frames, an average measure of background noise spectral parameters, an average measure of background noise zero crossings, an average measure of background noise energy, and an average background noise low-band energy;

excluding from the initialization any of the beginning frames having the average measure of the background noise energy less than a significantly low energy level; and

excluding from the initialization any of the background noise parameters from beginning frames having a measure of the background noise energy less than the significantly low energy level.